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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/765,435	01/27/2004	Subhendu Guha	USS-18302/16	1518

25006 7590 05/03/2007

GIFFORD, KRASS, SPRINKLE,ANDERSON & CITKOWSKI, P.C
PO BOX 7021
TROY, MI 48007-7021

EXAMINER	
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ART UNIT	PAPER NUMBER
2822	

MAIL DATE	DELIVERY MODE
05/03/2007	PAPER

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/765,435
Filing Date: January 27, 2004
Appellant(s): GUHA ET AL.

United Solar Systems Corporation
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed on 11/30/2006 appealing from the Office action mailed on 06/07/2006

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,274,461	Guha et al	8-2001
2003/0036090	Patil et al	2-2003
5,786,023	Maxwell et al	7-1998

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-8, 11, and 13-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Guha et al (U.S. 6,274,461).

As to claim 1, Guha et al teaches in figures 1-2 a process for the plasma deposition of layer of microcrystalline semiconductor material, wherein a process gas which includes a precursor of the semiconductor material and a diluent is energized with electromagnetic energy so as to create a plasma therefrom, which plasma deposits a layer of the microcrystalline semiconductor material onto a substrate (see col. 2, lines 43-61), wherein the improvement comprises: varying the concentration of the diluent in the process gas as a function of the thickness of the layer of microcrystalline semiconductor material which has been deposited (see col. 6, lines 20-53).

As to claim 2, Guha et al teaches in figures 1-2 a process, wherein the concentration of the diluent is decreased as the thickness of the layer increases (see col. 6, lines 48-53 and 62-67).

As to claim 3, Guha et al teaches in figures 1-2 a process, wherein the concentration of the diluent is varied in a stepwise manner as the thickness of said layer increases (see col. 6, lines 48-53).

As to claim 4, Guha et al teaches in figures 1-2 a process, wherein the concentration of the diluent is varied as a continuous function of the thickness of the layer (see col. 2, line 62 – col. 3, line 12).

As to claim 5, Guha et al teaches in figures 1-2 a process, wherein the microcrystalline semiconductor material includes a group IV element (see col. 5, lines 36-40).

As to claim 6, Guha et al teaches in figures 1-2 a process, wherein the process gas comprises a member selected from the group consisting of: SiH_4, Si_2H_6, GeH_4, SiF_4, GeF_4 or combinations thereof (see col. 8, lines 52-54).

As to claim 7, Guha et al teaches in figures 1-2 a process, wherein the diluent is selected from the group consisting of hydrogen, deuterium, a halogen or combinations thereof (see col. 8, lines 55-57).

As to claim 8, Guha et al teaches in figures 1-2 a process, wherein the diluent comprises hydrogen (see col. 8, lines 65-67).

As to claim 11, Guha et al teaches in figures 1-2 a process, wherein the step of varying the concentration of the diluent in the process gas comprises changing the amount of the diluent in the process gas (see col. 8, lines 61-64).

As to claim 13, Guha et al teaches in figures 1-2 a process including the further step of varying at least one other deposition parameter as a function of the thickness of the layer of microcrystalline semiconductor material which has been deposited, the other deposition parameter being selected from the group consisting of: process gas pressure, power density of the electromagnetic energy, frequency of the electromagnetic energy, or substrate temperature (see col. 2, lines 43-61).

As to claim 14, Guha et al teaches in figures 1-2 a process, wherein the semiconductor material includes silicon and germanium therein and wherein the process gas includes a silicon-containing compound ("silicon to germanium"), a germanium-containing compound (see col. 2, line 62 – col. 3, line 7), and a diluent selected from the group consisting of hydrogen, deuterium or combinations thereof, and wherein the ratio of the silicon-containing compound to the germanium-containing compound is varied while the semiconductor material is being deposited so that the silicon/germanium ratio of the layer of semiconductor material varies as a function of layer thickness (see col. 3, lines 7-12; and col. 9, line 4 – col. 10, line 10), and wherein the concentration of the diluent gas in the process gas is increased as the ratio of the germanium-containing compound to the silicon-containing compound therein increases (col. 2, line 62 – col. 3, line 12).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guha et al (U.S. 6,274,461) in view of Patil et al (U.S. 2003/0036090).

As to claims 9 and 10, Guha does not disclose the electromagnetic energy is microwave energy or radiofrequency energy.

Patil teaches the electromagnetic energy is microwave energy or radiofrequency energy (see paragraphs [0027] & [0028]). Therefore, it would have been obvious to a

person having ordinary skill in the art at the time the invention was made to modify the process of Guha by using the electromagnetic energy which is microwave energy or radiofrequency energy for providing a specific range of frequency (see paragraphs [0027] & [0028] in Patil).

5. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Guha et al (U.S. 6,274,461) in view of Maxwell et al (U.S. 5,786,023).

Guha does not disclose the step of varying the concentration of the diluent in the process gas comprises changing the amount of the semiconductor precursor in the process gas.

Maxwell teaches in col. 13, lines 63-67 a step of varying the concentration of the diluent in the process gas comprises changing the amount of the semiconductor precursor in the process gas. Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the process of Guha by having the step of varying the concentration of the diluent in the process gas comprises changing the amount of the semiconductor precursor in the process gas as taught by Maxwell for providing a growth of the layer (thin film) or increasing layer thickness.

(10) Response to Argument

Response to argument directed to the rejection of claims 1-8, 11, and 13-14 as being anticipated by Guha et al (U.S. 6,274,461).

The claim is in the Jepson type format, wherein the preamble is conventional or known prior art. See MPEP 2129, 608.01(m) and also 37 C.F.R. 1.75(e). Therefore, the invention comprises what is written in the last two lines of the claim, specifically:

"varying the concentration of the diluent in said process gas as a function of the thickness of the layer of microcrystalline semiconductor material which has been deposited"

- In the Appellant's argument on page 7, lines 4-6 (counting from the bottom of the page), the applicant has argued that the cited reference of Guha et al. is "specifically directed to the preparation of high quality amorphous semiconductor materials".

The Appellant's argument has been fully considered but it is not persuasive. Although Guha et al. does teach "preferably" forming an amorphous material, the reference is not specific to only forming amorphous layers. This is clearly outlined in column 5, lines 5-8 of Guha et al. which states that another aspect of the present invention is fabrication of a thin film semiconductor material, such as a highly microcrystalline layer. Specific sections of the reference cannot be ignored, even though one method of forming is noted as being preferable over the other method. Since the reference positively teaches forming a microcrystalline semiconductor material, then the reference is valid prior art. Guha et al. clearly teach the claimed invention in column 2, lines 43-61 and column 6, lines 31-67, with respect to varying parameters of the deposition process. Since the preamble of the claim is all admitted prior art under the Jepson claim type format as note above, then the limitations of the claim are met by Guha et al.

- Appellant further argued that the '461 patent teaches away from the principles of the present invention.

The Appellant's argument has been fully considered but it is not persuasive because Guha et al clearly teaches in col. 2, lines 43-55 the deposition parameters of the process, which include process gas composition, process gas pressure, power density of the electromagnetic energy and substrate temperature, will determine whether the deposited semiconductor material is microcrystalline. Therefore, the Guha reference can not teach away from the principles of the present invention.

- Appellant further argued the '461 patent teaches that it is necessary to decrease the dilution of the process of the process gas as an amorphous semiconductor layer is grown so as to keep that layer amorphous and prevent it from becoming microcrystalline.

The Appellant's argument has been fully considered but it is not persuasive. Although Guha et al. does teach "preferably" forming an amorphous material, the reference is not specific to only forming amorphous layers. This is clearly outlined in column col. 2, lines 43-55, and col. 5, lines 5-8 of Guha et al. which states that another aspect of the present invention is fabrication of a thin film semiconductor material, such as a highly microcrystalline layer.

- Appellant further argued that there is teaching in Guha '461 of processes for preparing superior microcrystalline materials by controlling deposition parameters in accord with the claims at issue.

The Appellant's argument has been fully considered but it is not persuasive. Guha et al clearly teaches the same process for the plasma deposition of a layer of

microcrystalline semiconductor material (see col. 2, lines 43-55, and col. 5, lines 5-8 in Guha).

- Appellant further argued that even the Guha reference teaches "a layer of microcrystalline semiconductor material that is plasma deposited onto a substrate", this would clearly not be enough to defeat Appellants' claim 1, and certainly not under 102(b) because claim 1 does not claim "a layer of microcrystalline semiconductor material that is plasma deposited onto a substrate".

The Appellant's argument has been fully considered but it is not persuasive. The claimed limitation of "plasma deposites a layer of said microcrystalline semiconductor material onto a substrate" is in the Jepson type format, wherein the preamble is conventional or known prior art. See MPEP 2129, 608.01(m) and also 37 C.F.R. 1.75(e). Therefore, the invention comprises what is written in the last two lines of the claim, specifically:

"varying the concentration of the diluent in said process gas as a function of the thickness of the layer of microcrystalline semiconductor material which has been deposited" (see col. 2, lines 43-55; col. 5, lines 5-8; and col. 6, lines 51-54 in Guha).

- Appellant further argued that the missing from the examiner's anticipation rejection is any congent explanation of how or where the Guha reference teach controlling the process parameters in the manner claimed in claim 1 to optimize the characteristics of the microcrystalline layer so produced.

The Appellant's argument has been fully considered but it is not persuasive. Guha clearly teaches in col. 6, lines 51-54 the same process for controlling the process

parameters in the manner claimed in claim 1 to optimize the characteristics of the microcrystalline layer (see col. 4, lines 54-61; and col. 6, lines 51-54).

- Appellant further argued that Guha et al teaches away from the present invention. The '461 patent teaches that it is necessary to decrease the dilution of the process gas as an amorphous semiconductor layer is grown so as to keep the layer amorphous and prevent it from becoming microcrystalline.

The Appellant's argument has been fully considered but it is not persuasive. Although Guha et al. does teach "preferably" forming an amorphous material, the reference is not specific to only forming amorphous layers. This is clearly outlined in column 5, lines 5-8 of Guha et al. which states that another aspect of the present invention is fabrication of a thin film semiconductor material, such as a highly microcrystalline layer.

- Appellant further argued that the teaching of Guha et al and the teaching of the present invention are directly opposite. This evidences the fact that the two are directed to very different deposition processes.

The Appellant's argument has been fully considered but it is not persuasive. Guha et al clearly teaches in col. 2, lines 43-55, and col. 5, lines 5-8, the deposition parameters of the process, which include process gas composition, process gas pressure, power density of the electromagnetic energy and substrate temperature, will determine whether the deposited semiconductor material is microcrystalline. Therefore, the Guha reference can not teach away from the principles of the present invention.

- Appellant further argued that the examiner has cited to no teaching at all in the prior art showing or suggesting that superior quality microcrystalline

semiconductor materials can be prepared in the plasma deposition process by varying the concentration of a diluent in the process gas as a function of the thickness of the depositing layer of microcrystalline semiconductor material. And since the examiner has completely failed to make such a showing, she has not presented even a prima facie case of either anticipation by Guha et al. or obviousness over the reference, either taken singly or in combination with any other reference of record.

The Appellant's argument has been fully considered but it is not persuasive. Guha reference teaches the same process of varying the concentration of the diluent in the process gas as a function of the thickness of the layer of microcrystalline semiconductor material which has been deposited (see column 2, lines 43-61, and column 6, lines 51-54). Therefore the same result is occurred. Regarding the term "superior quality", the term is subjective and does not appear in the claimed limitation.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

TYT

March 26, 2007

Conferees:

David Blum, SPE

Zandra Smith, SPE

27 April 2007

Thanh Y. Tran, Examiner